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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/807,298 | 04/09/2001 | Frank Leonard Schadt III | PE0612 | 5947 |

23906 7590 09/18/2002

E I DU PONT DE NEMOURS AND COMPANY
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WILMINGTON, DE 19805

| EXAMINER |
|---|
| CLARKE, YVETTE M |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1752 | |

DATE MAILED: 09/18/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application N . | Applicant(s) | |
|---|---|---|---|
| | 09/807,298 | SCHADT III ET AL. | |
| | Examiner | Art Unit | |
| | Yvette M. Clarke | 1752 | |

*-- The MAILING DATE of this communication appears n the cover sh et with the correspondenc address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *09 April 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 April 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

This is written in reference to application number 09/807298 filed on April 9, 2001.

### *Response to Amendment*

1. The preliminary amendment filed on June 4, 2001 has been entered and fully considered.

### *Information Disclosure Statement*

2. The Information Disclosure Statement filed on August 18, 2001 has been entered and fully considered.

### *Claim Objections*

3. Claim 17 is objected to because of the following informalities: line 2 of the instant claims contains a typographical error. The examiner suggests changing "form" to --from--. Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

5. Claims 1-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear to the examiner where the repeating unit of instant claims 1 and 27 are actually located. The claims set forth the limitation that the "branched segment(s) contains at least two repeating monomer units". The term "monomer units" leads the examiner to believe that the applicant is claiming a copolymer. The applicant has found no explanation in the specification for how the branched segment contains repeating units.

The specification does however provide support for copolymer structures (see examples). Clarification is requested.

6. Claims 16 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim as written is unclear. The claim require at least 60% of acrylate and at least 60% of methacrylate, which totals more than a 100%. It is unclear how much styrene needs to be present or if the presence of styrene is even required. The examiner has interpreted the term "styrenic" to mean any styrene derivative. For purposes of examination, the examiner has interpreted the claim to pertain to a terpolymer comprising acrylic, methacrylic and styrenic derivatives.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

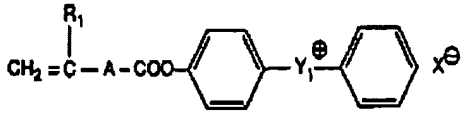
> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in-
>
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
>
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

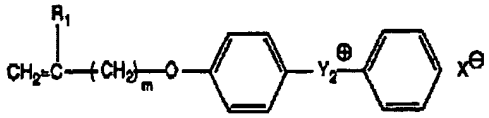
8. Claims 1-4, 9, 14 and 27-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamana et al. (SPIE Vol 3333). Yamana teaches a resist composition comprising triphenylsulfonium triflate as an acid generator and either the copolymer poly(carboxy-tetracyclododecyl methacrylate$_{70}$-co-tetrahydropyranylcarboxytetracyclodecyl methacrylate$_{30}$) or the terpolymer poly(tricyclodecylacrylate$_{60}$-co-tetrahydropyranylmethacrylate$_{20}$-co-methacrylic acid$_{20}$) (abstract). The said resist samples were coated on a silicon substrate and pre-baked at 90°C for 90 seconds. The samples were exposed to ArF excimer laser exposure tool. Then the samples were post-exposure baked at 80°C for 90 seconds for the copolymer resist and at 100°C for 90 seconds for the terpolymer resist. TMAH was used to develop the formed pattern (section 2. experimental). It is the examiner's position that the taught copolymer and terpolymer meet the limitations of a branched polymer having protected acid groups and would inherently have a glass transition temperature of at least 22°C.

9. Claims 1-4, 9-15, 27-30 and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Houlihan et al. (Macromlecules 1997). Houlihan teaches a three-component system comprising a poly(norbornene-alt-maleic anhydride-co-acrylic acid-co-tert-butyl acrylate terpolymer, a dissolution inhibitor and a photoacid generator (PAG). The said matrix resin is developable in an aqueous developer. The three-component system was prepared in cyclohexanone (pg. 6520, "lithographic evaluation"-pg. 6521). The resist was spun on silicon wafers. Prior to development, the films were baked to ensure consistent solvent evaporation and film annealing. The films were developed in TMAH (pg. 6524 "development studies"). It is the examiner's position that the taught terpolymer meet the

limitations of a branched polymer having protected acid groups and would inherently have a glass transition temperature of at least 22°C.

10. Claims 1 and 5-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Schadlei et al. (EP 473547 A, abstract). Schadeli teaches an olefinic unsaturated onium salts of given formula (I) and (II):


(I)


(II)

. The said compounds are light sensitive monomers, which can be used in the production of photographic films and photoresists for electronics. It is the examiner's position that the taught compounds meet the limitations of a branched polymer wherein the acid generator is covalently bonded to the branched polymer.

11. Claims 1-4, 9-15, 27-30 and 32 are rejected under 35 U.S.C. 102(e) as being anticipated by Allen et al. (US 6165678 A). Allen teaches a radiation sensitive lithographic photoresist composition comprising an acid generator and an acrylate or methacrylate copolymer (abstract). Example 1 exemplifies the synthesis of a copolymer comprising 2-trifluoromethanesulfonylaminoethyl methacrylate, isobornyl methacrylate and t-butyl methacrylate (c. 13, l. 1-18). Example 5 teaches the synthesis of a methacrylate copolymer comprising 5-(4)-cyano-2-norbornyl methacrylate, methacrylonitrile, t-butyl methacrylate, methacrylic acid and isopropyl alcohol (c. 14, l. 19-43). Examples 10 and 11 exemplify the use of the said copolymer in a two-component and three-component resist, respectively (c.

16, l. 60-c. 18, l. 16). The two-component resist comprises the said copolymer and a photoacid generator. The three-component resist comprises the said copolymer, a photoacid generator and a dissolution inhibitor. The taught resist components were dissolved in PGMEA and coated on silicon wafers, baked, exposed, post-baked and developed with TMAH to form a pattern. It is the examiner's position that t-butyl methacrylate meets the limitation of a branched polymer containing protected acid groups and would inherently have a glass transition temperature of at least 22°C.

12. Claims 1-4, 9-16, 27-30 and 32 are rejected under 35 U.S.C. 102(e) as being anticipated by Breyta et al. (US 5492793 A). Breyta teaches a photoresist composition comprising (i) a photosensitive acid generator and (ii) a polymer comprising the reaction product of hydroxystyrene with acrylate, methacrylate or a mixture of acrylate and methacrylate (see abstract; claim 1). The acrylate or methacrylate monomer or oligomer compound of the polymer provides acid sensitivity to the polymer. The ester group of the acrylate or the methacrylate is an acid labile group, which inhibits the dissolution of the polymer in alkaline developer or polar solvent. Suitable ester substituents are t-butyl and α-methylbenzyl (c. 3, l. 12). A variety of acid generators can be used in the composition. Suitable examples include triaryl sulfonium hexafluoroantimonate, diaryliodonium metal halides, and certain non-ioinic acid generators such as tris(sulfonates) of pyrogallol and N-sulfonyloxynaphthalimides (c. 3, l. 48-12). The composition is readily used in standard lithographic imaging processes. Generally, the first step involves coating the substrate with a film comprising the said polymer and acid generator dissolved in a suitable solvent. Prior to exposure the film is heated to remove solvent. The film is imagewise exposed to radiation

suitably e-beam or electromagnetic radiation, post-baked to an elevated temperature above 110-160°C. The last step of the process involves development of the image in the film (c. 3, l. 62-c. 5, l. 19).

Allowable Subject Matter

13. Claims 17-26, 31 and 33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

14. The following is a statement of reasons for the indication of allowable subject matter: review of the prior art failed to teach and/or suggest a photoresist material comprising a fluorine-containing copolymer in combination with a photogenerator as set forth in instant claims 17 and 21. Fluorinated compounds are known in the art however, the examiner failed to find a reference with had a filing date which was citable as prior art. The examiner directs the applicant's attention to US 2001/0018162 A1 and US 2001/0010890 A1.

***Conclusion***

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Fryd et al. (WO 92/15628) which teaches a photosensitive composition containing comb polymer binders having a branched polymer comprising a hydrophilic group.
- Weng et al. (US 6117962 A) pertaining to a vinyl-containing stereospecific polypropylene macromers.
- Goupil et al. (US 2001/0051670 A1) pertaining to tissue bulking and coating compositions.
- Kaimoto et al. (US 5585222 A) which teaches a resist compiston and process for forming resist pattern.

- Ohmori et al. (US 4665144 A) which teaches a material for contact lenses.
- Barclay et al. (US 5861231 A) which teaches copolymers and photoresist compositions comprising copolymer resin binder component.
- Narita et al. (US 4613657 A) which teaches a method for anionic homopolymerization of α-trifluoromethylacrylate.
- Lin et al. (US 6210856 B1) pertaining to a resist composition and process of forming a patterned resist layer on a substrate.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yvette M. Clarke whose telephone number is 703-305-0589. The examiner can normally be reached on Monday-Thursday 8-6:30.

17. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Janet C. Baxter can be reached on 703-308-2303. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

18. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1193.

ymc
September 16, 2002

JANET BAXTER
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700